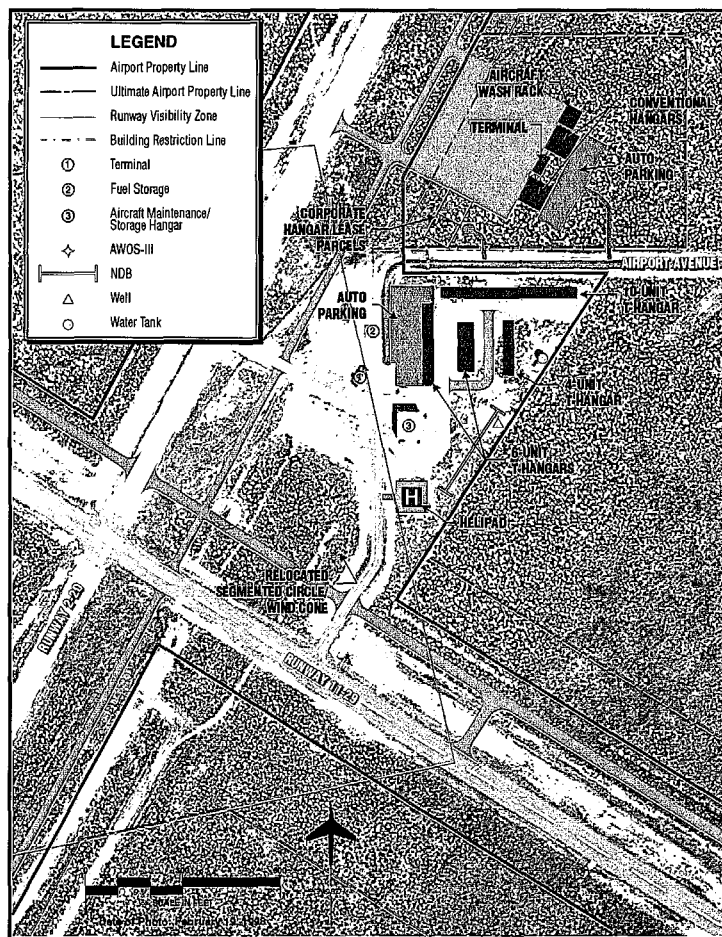




Chapter Four

AIRPORT DEVELOPMENT ALTERNATIVES

AIRPORT DEVELOPMENT ALTERNATIVES



In the previous chapter, airside and landside facility needs that would satisfy projected demand over the planning period were identified. The next step in the master planning process is to evaluate the various ways these facilities can be provided. In this chapter, these facility needs will be applied to a series of airport development alternatives. There are numerous possible combinations of alternatives, so some intuitive judgement must be applied to

identify those alternatives which have the greatest potential for implementation. The alternatives analysis is an important step in the planning process since it provides the underlying rationale for the final master plan recommendations.

While any evaluation of alternatives can also include a "no action" alternative, this would effectively reduce the quality of services being provided to the general public, and potentially affect the area's ability to accrue additional economic growth. The airport's aviation forecast and the analysis of facility requirements indicate both a current and future need for the development of aircraft storage facilities and improved navigational aids and lighting. Without these facilities,

regular users of the airport will be constrained from taking maximum advantage of the airport's air transportation capabilities.

AIRPORT DEVELOPMENT ALTERNATIVES

The previous chapter identified both the airside and landside facilities necessary to satisfy forecast demands through the

planning period. The overall objective is to produce a balanced airside and landside complex to serve forecast aviation demands.

The development alternatives for the airport can be categorized into two functional areas: the airside (runways, taxiways) and landside (terminal building, aircraft storage facilities, aircraft parking apron). Within each of these functional areas, specific facilities are required or desired. Although each functional area is treated separately, each area interrelates to each other and affects the development potential of the other. Therefore, these areas must be examined both individually and collectively to ensure a final plan that is functional, efficient, cost effective, and minimizes environmental impacts. Through this process, a basic airport concept is developed into a realistic development plan.

AIRFIELD

Airfield facilities are, by nature, the focal point of the airport complex. Because of their primary role and the fact that they physically dominate airport land use, airfield facility needs are often the most critical factor in the determination of viable airport development alternatives. In particular, the runway system requires the greatest commitment of land area and often imparts the greatest influence on the identification and development of other airport facilities. Furthermore, due to the nature of aircraft operations, there are a number of FAA design criteria that must be considered when looking at airfield improvements. These

criteria can often have a significant impact on the viability of various alternatives designed to meet airfield needs.

FAA design criteria define the physical attributes of runways, taxiways, and the separation of facilities, as well as imaginary surfaces, which protect aircraft from objects which could present a hazard to navigation. As discussed previously in Chapter Three, FAA design criteria is a function of the approach speed and wingspan of the most demanding aircraft to operate at the airport (defined as 500 annual operations), and in some cases, the approach visibility minimums. The Federal Aviation Administration (FAA) has established the Airport Reference Code (ARC) to relate these factors to airfield design standards. Runway 11-29 was designed and constructed to ARC B-II (aircraft approach speeds less than 120 knots, wingspans less than 79 feet) design standards, while Runway 2-20 was designed and constructed to ARC B-I (aircraft approach speeds less than 120 knots, wingspans less than 49 feet) design standards.

In the previous chapter, these ARCs were evaluated to determine if they meet the requirements of the future fleet mix. As discussed in the previous chapter, while the airport should expect an increase in operations by larger, more sophisticated aircraft through the planning period, this increase is not expected to result in an increase in design standards.

While the airport is not expected to surpass the threshold of 500 annual operations to qualify for federal funding

to upgrade Runway 11-29 design standards, this does not prevent the airport from planning for this possibility in the future. As shown in **Table 4A**, an upgrade to ARC C-II design standards requires greater separation distances between facilities and larger

safety areas. Since the airport presently has limited landside developments, placing future facilities to conform with ARC C-II standards could prevent the need to relocate these facilities at a later date.

TABLE 4A
Airfield Design Standards by ARC

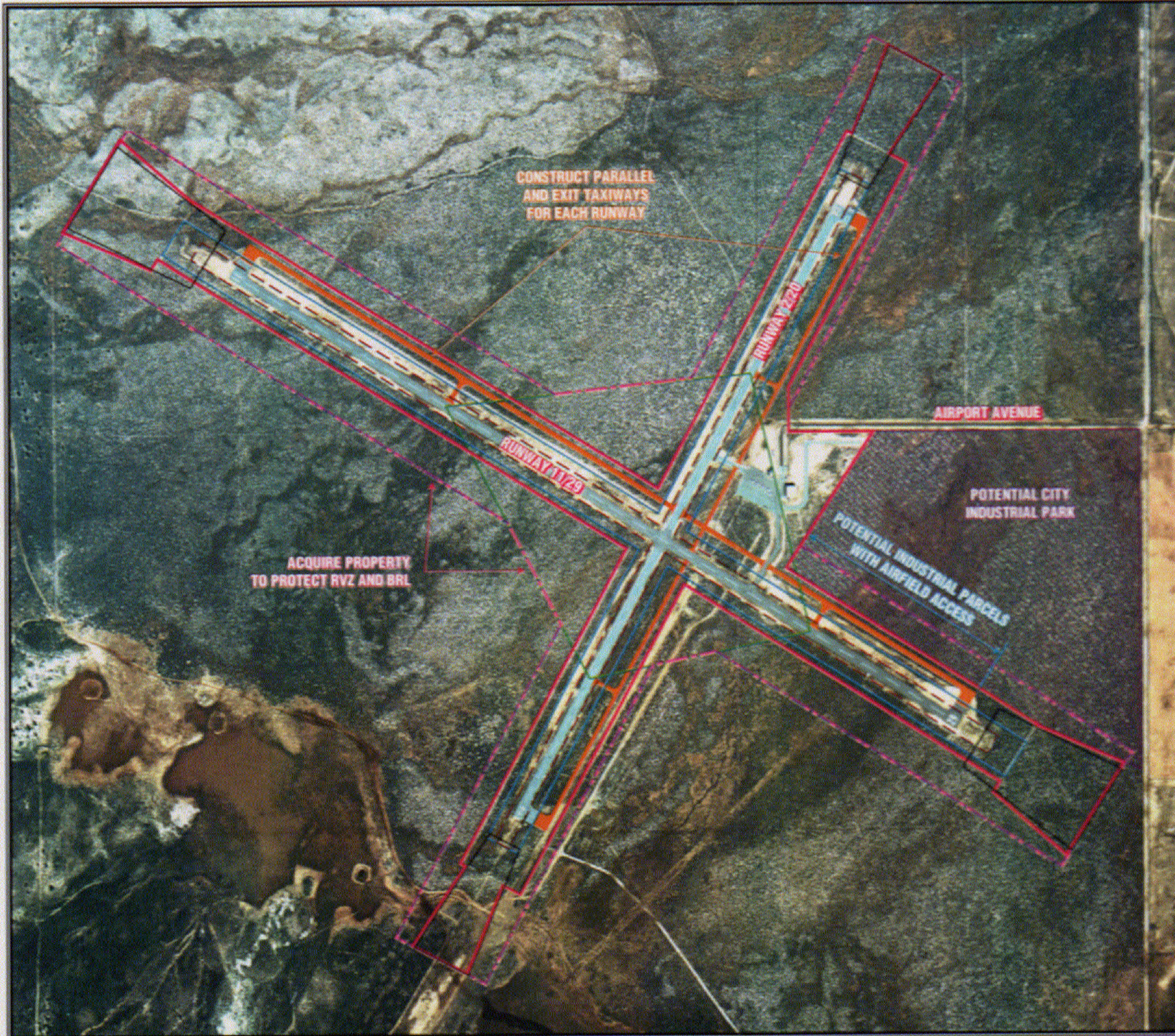
Airport Reference Code Approach Visibility Minimums	B-I ¹ One Mile	B-II One Mile	C-II One Mile
<u>Runway</u>			
Width	60	75	100
Runway Safety Area (RSA)			
Width	120	150	400
Length Beyond Runway End	240	300	1,000
Object Free Area (OFA)			
Width	250	500	800
Length Beyond Runway End	240	300	1,000
Runway Centerline to:			
Parallel Taxiway Centerline	150	240	300
Edge of Aircraft Parking Apron	125	250	400
<u>Runway Protection Zones (RPZ)</u>			
Inner Width	250	500	500
Outer Width	450	700	1,010
Length	1,000	1,000	1,700
<u>Obstacle Clearance</u>	20:1	20:1	20:1
<u>Building Restriction Line</u> ¹			
Distance from Runway Centerline	370	495	495
<u>Taxiways</u>			
Width	25	35	
Safety Area Width	49	79	
Object Free Area Width	89	131	
Taxiway Centerline to:			
Parallel Taxiway/Taxilane	69	105	
Fixed or Moveable Object	44.5	65.5	
<u>Taxilanes</u>			
Taxilane Centerline to:			
Parallel Taxilane Centerline	64	97	
Fixed or Moveable Object	39.5	57.5	
Taxilane Object Free Area	79	115	
Source: FAA Airport Design Software Version 4.2D, F.A.R. Part 77, TERPS			
¹ Small Aircraft less than 12,500 pounds			
² 35-Foot Building Height			

Exhibit 4A depicts ARC B-I and ARC B-II runway safety area (RSA), object free area (OFA), and runway protection zone (RPZ) design standards at the airport. As shown on the exhibit and detailed in the previous chapter, the airport presently conforms with existing design requirements. Only a small portion of the Runway 11 and 29 RPZs extend beyond the existing airport property line. The FAA recommends that the RPZ be under control of the airport. Colorado City should consider acquiring fee simple title to this property.

Presently, the airport does not fully protect the runway visibility zone (RVZ) and transitional surfaces for each runway. The RVZ is required for airports without an air traffic control and intersecting runways to provide adequate line-of-sight for aircraft between the intersecting runways. This RVZ is intended to reduce the possibility of aircraft collisions resulting from two aircraft using different runways. The RVZ clearing standards specify that this area should be clear of objects which could prevent an adequate view of the intersecting runway. As shown on **Exhibit 4A**, the terminal building and apron are within the limits of the RVZ. Portions of the RVZ also extend beyond the existing airport property line. Since Colorado City does not own the property where the RVZ extends beyond the existing airport property line, a situation could arise where incompatible objects are constructed in the RVZ, compromising aircraft safety at the airport. Colorado City should consider acquiring the property necessary to protect the RVZ.

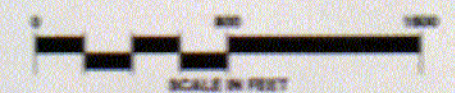
The transitional surfaces are a component of Federal Aviation Regulations (FAR) Part 77, which are intended to protect aircraft operating areas from hazards that could affect the safe and efficient operation of aircraft arriving and departing the airport. The transitional surface connects with the outside edge of the primary surface and rises at a slope of seven to one. There is not a restriction on objects within the transitional area, as long as they remain below the sloping surface. The primary surface is a rectangular surface centered on the runway centerline which extends 200 feet beyond each runway end and is the same width as the inner width of the runway protection zone.

A line marking a 35-foot clearance of the transitional surface is shown on **Exhibit 4A**. Traditionally, this has served as the building restriction line for an airport. While not required, the FAA encourages airports to have fee simple control over the transitional surfaces to the point of the BRL. As shown on the exhibit, most of the transitional surface is outside the existing airport property line. Presently, there are no structures within the transitional surface. However, similar to the RVZ surface, since Colorado City does not own this property, a situation could arise where incompatible objects are constructed in the RVZ. Consideration may be given to obtaining fee simple title of the property adjacent to the airport to protect the transitional surfaces for each runway from encroachment. While the recently enacted height and hazard zoning for the airport provides limited



LEGEND

- Airport Property Line
- - - Ultimate Airport Property Line
- Runway Visibility Zone (RVZ)
- Runway Protection Zone (RPZ)
- - - Runway Safety Area (RSA)
- - - Building Restriction Line (BRL)
- Object Free Area (OFA)



Date of Photo: February 19, 1998



protection for the transitional surfaces from encroachment (if enforced during the construction process), fee simple acquisition of this property provides total control over the property and ensures compatible development.

The existing instrument approach capability of the airport includes a nondirectional beacon NDB approach. The NDB-A approach enables aircraft with approach speeds less than 90 knots to land at the airport when cloud ceilings are as low as 900 feet above the ground and visibility is reduced to one mile. For aircraft with higher approach speeds, the visibility minimums gradually increase to 1¼ miles, 2½ miles, and 2¾ miles.

As mentioned in the facility requirements, the existing NDB approach provides only limited approach capability for aircraft due to its high cloud ceiling and visibility minimums (especially for aircraft with higher speeds). Those most affected are the business users of the airport which generally fly aircraft with higher approach speeds. The greatest disadvantage of this limited instrument approach capability is the impact on these users of the airport. If the airport is inaccessible due to reduced visibility conditions, aircraft must divert to another regional airports such as St. George, which are not as conveniently located to the Colorado City/Hildale area.

A Global Positioning System (GPS) approach to Runway 29 is included in the Arizona Department of Transportation, Aeronautics Division (ADOT) NAVAIDS plan. While the

NAVAIDS study notes that terrain east of the airport may impact a future GPS approach to Runway 29, a future GPS approach to Runway 29 could provide at least one mile visibility and 400-foot cloud ceiling minimums.

The extent to which the airport can obtain lower visibility minimums is dependent upon the results of a separate FAA airspace analysis and the airport installing additional approach lighting aids and pavement markings as detailed in the previous chapter. An additional concern is that the RPZs increase in size as well. This requires the acquisition of land to protect the RPZ surface. The location of the BRL is also impacted. A larger RPZ would extend the BRL an additional 250 feet on either side of the runway.

Advances in airplane navigational equipment technology and pilot training makes it possible for virtually every properly equipped general aviation aircraft to conduct operations during reduced visibility and cloud ceiling situations. In addition, the increased use of general aviation aircraft for business and corporate uses has advanced the need for better approaches at non-commercial airports so that business travelers can maintain their schedules. Therefore, it is important for the Town of Colorado City to continually pursue the options for improved instrument approach capability at the airport. The primary intent of developing improved instrument approaches to the airport is to decrease the visibility and cloud ceiling minimums and reduce the time that the airport is inaccessible due to inclement weather.

Exhibit 4A depicts the development of parallel taxiways for each runway and runway exit taxiways midway between each runway end and the runway intersection. The facility needs evaluation indicated that parallel and exit taxiways improve airfield safety and capacity by reducing the amount of time that aircraft occupy the runway. Presently, aircraft must "back-taxi" along the runway to reach a runway end. The parallel taxiway to Runway 11-29 is shown at a runway/taxiway separation distance of 240 feet to conform with ARC B-II design standards. The parallel taxiway to Runway 2-20 is shown at a runway/taxiway separation distance of 225 feet. While this exceeds ARC B-I design standards for small aircraft, this conforms with previous planning.

These taxiways should be developed based on demand and priority. Initially, partial taxiway access could be developed to the most used runway ends with the remainder of the taxiway developed at a later date. Prior to developing parallel taxiway access for either runway, the existing segmented circle and wind cone must be relocated. The landside alternatives depict the relocation of the segmented circle and wind cone.

Exhibit 4A also depicts the area under consideration by Colorado City for the development of an industrial park. This is a preferred location for this type of land use as it is compatible with the airport. As depicted on the exhibit, the location of industrial facilities adjacent to the airport offers possibility for parcels with airfield access. This increases the marketability of the

industrial site and provides additional revenue possibilities (e.g., access fees for aircraft accessing the airport from the industrial park).

LANDSIDE

The primary landside facilities to be accommodated at the airport include airport-related businesses, public terminal facilities, aircraft storage hangars, and aircraft parking aprons. The interrelationship of these functions is important to defining a long range landside layout for the airport. To a certain extent, landside uses need to be grouped with similar uses or uses that are compatible. Other functions should be separated, or at least have well defined boundaries for reasons of safety, security, and efficient operation. Finally, each landside use must be planned in conjunction with the airfield (as well as ground access) that is suitable to the function. Runway frontage should be reserved for those uses with a high level of airfield interface, or need for exposure. Other uses with lower levels of aircraft movements, or little need for runway exposure can be planned in more isolated locations. The following briefly describes landside facility requirements.

Fixed Based Operator (FBO): This essentially relates to providing areas for the development of facilities associated with aviation businesses that require airfield access. This includes businesses involved with (but not limited to) aircraft rental and flight training, aircraft charters, aircraft maintenance, line service, and aircraft fueling. Businesses such as these are

characterized by high levels of activity with a need for apron space for the storage and circulation of aircraft. In addition, the facilities commonly associated with businesses such as these include large, conventional type hangars which hold several aircraft plus attached office and business space. Utility services are needed for these type of facilities as well as automobile parking areas. The facility requirements analysis projected a long term need for approximately 21,000 square feet of large conventional hangar space. Presently, the only aircraft storage/maintenance hangar on the airport is a 5,760 square-foot building leased by Westwing Aviation from Colorado City.

Enclosed T-Hangars and T-Shade Hangars: The facility requirements analysis indicated that 14 T-hangar units may be needed to accommodate projected long term demand. Previous planning included developing T-hangars along the taxiway extending behind the aircraft storage/maintenance hangar. Colorado City will be developing an 8-unit T-hangar along north side of T-hangar access taxiway in 1998. A consideration with the layout of this area is the single point of access and egress along the taxiway. This could create potential conflicts on the taxiway as aircraft would have no alternative outlets and aircraft could potentially block access to and from hangars.

Hangar Lease Parcels: This involves providing parcels of land for businesses or individuals who wish to construct their own aircraft storage hangar. The best location for these facilities is off the immediate flight line but readily

accessible. Parking and utilities such as water and sewer should be considered for these areas. Previous planning provided for hangar lease parcels along the west side of the T-hangar access taxiway.

Other Facilities: The facility requirements analysis indicated that consideration should be given to developing a helipad to serve helicopter operations at the airport and that an aircraft wash rack should be considered to provide a suitable area for the washing of aircraft.

Prior to considering landside development alternatives, constraints within the existing terminal area must be addressed. As described previously, the RVZ limits development to the west. Future facilities should be located outside the limits of the RVZ and long range planning should provide for clearing the RVZ of existing obstructions. A consideration with the RVZ is that any extension of Runway 11-29 to the east or Runway 2-20 to the northeast would move the RVZ to the east. For example, an 500-foot extension of Runway 11-29 to the east would place the existing aircraft storage/maintenance hangar (occupied by Westwing Aviation) within the limits of the RVZ.

The existing property line limits development to the east. Additionally, the location of the NDB, AWOS-III, well, and water storage tank also limit development to the east. While the NDB and AWOS-III can be relocated, both NAVAIDS are certified by the FAA. Relocating them would require that they be decommissioned and

certified in their new location. In the case of the NDB, the existing NDB-A approach would be decommissioned as well. While relocating these facilities may not be preventable, alternatives should consider development which does not require their relocation.

Exhibit 4B depicts Landside Alternatives A and B. Landside Alternative A incorporates provisions of previous planning efforts. For example, the existing apron is expanded to the south to provide additional tiedown locations and T-hangar and corporate/individual hangar lease parcels are developed along the existing T-hangar taxiway. To meet long term needs, a second conventional hangar is developed south of the existing aircraft storage/maintenance hangar. A helipad is developed on the south edge of the expanded apron, while an aircraft wash rack is proposed south of the proposed conventional hangar.

Advantages: This alternative meets projected long term hangar, apron, and auto parking needs. This alternative maximizes existing airport property and investments in existing pavements. Additionally, this alternative avoids the displacement of the NDB and AWOS-III.

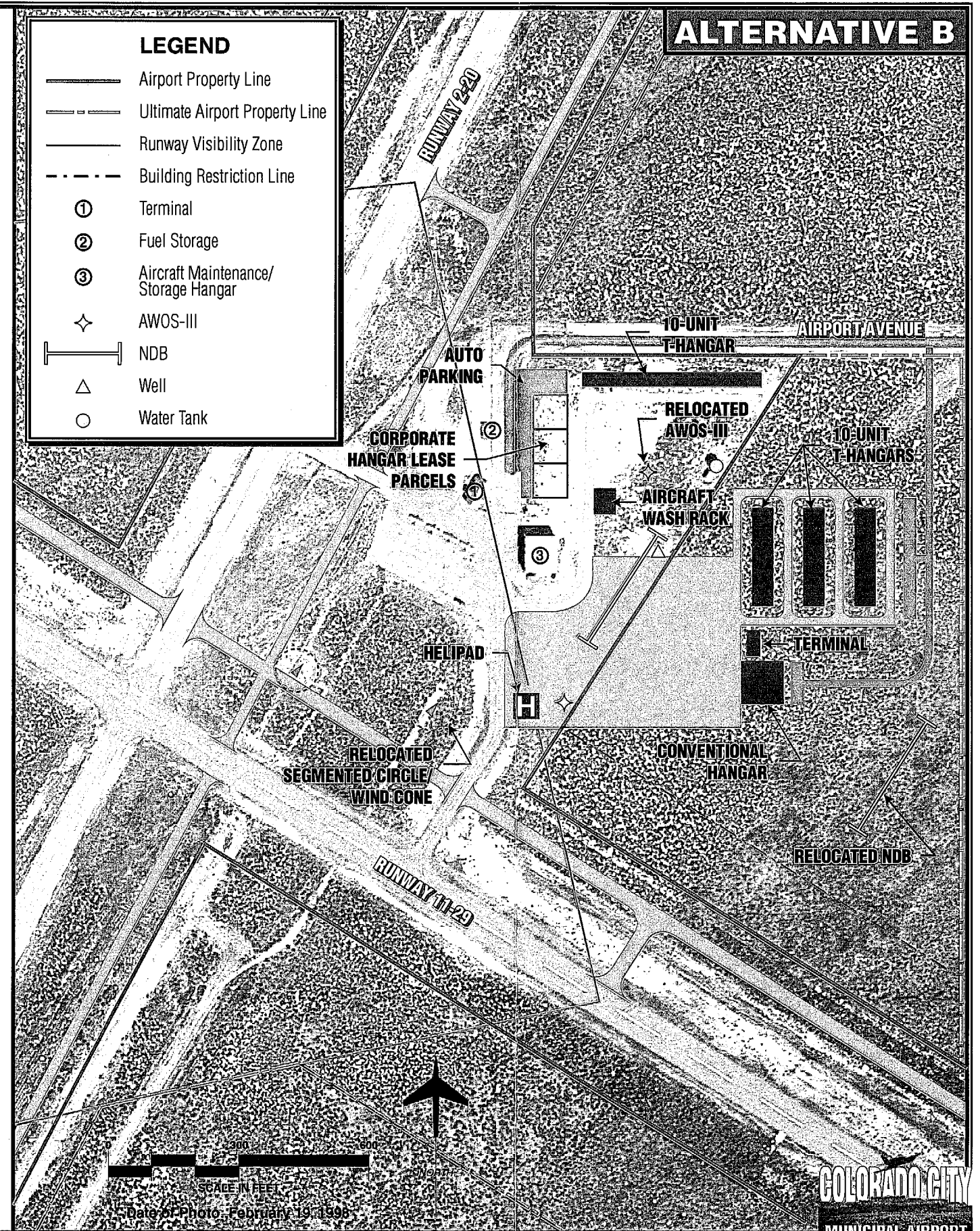
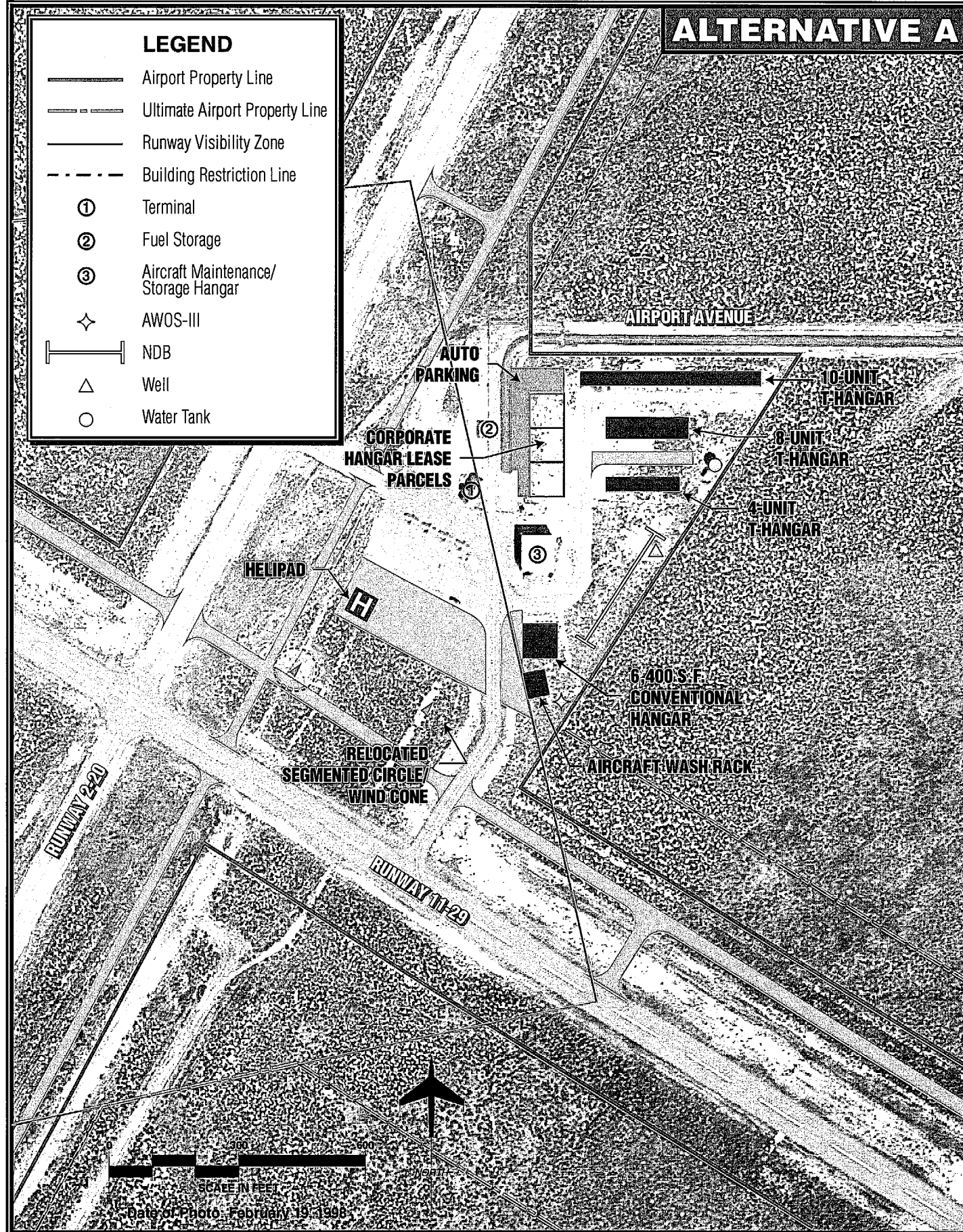
Disadvantages: This alternative does not provide for the relocation of facilities within the RVZ. Vehicles accessing the future conventional hangar and T-hangars would be required to cross aircraft operating areas along the apron and T-hangar taxiway. (Public vehicle access and aircraft operational areas should be segregated to the extent possible.)

Landside Alternative B, depicted on **Exhibit 4B**, proposes to acquire property adjacent to the airport for future facility development. As shown on the exhibit, apron would be developed along the east side of the Runway 11-29 connecting taxiway to replace the apron within the RVZ and accommodate long term growth. Long term T-hangar and conventional hangar development would be directed to the east end of the apron. Hangar development along the T-hangar access taxiway would be limited to three corporate/individual hangar parcels along the west side of the taxiway and a 10-unit T-hangar along the north side of the taxiway to provide for the relocation of the AWOS-III. The NDB is relocated to the east side of the apron. Terminal building functions would ultimately be located along the expanded apron. A helipad is proposed along the south side of the apron, while an aircraft wash rack is proposed along the T-hangar access taxiway.

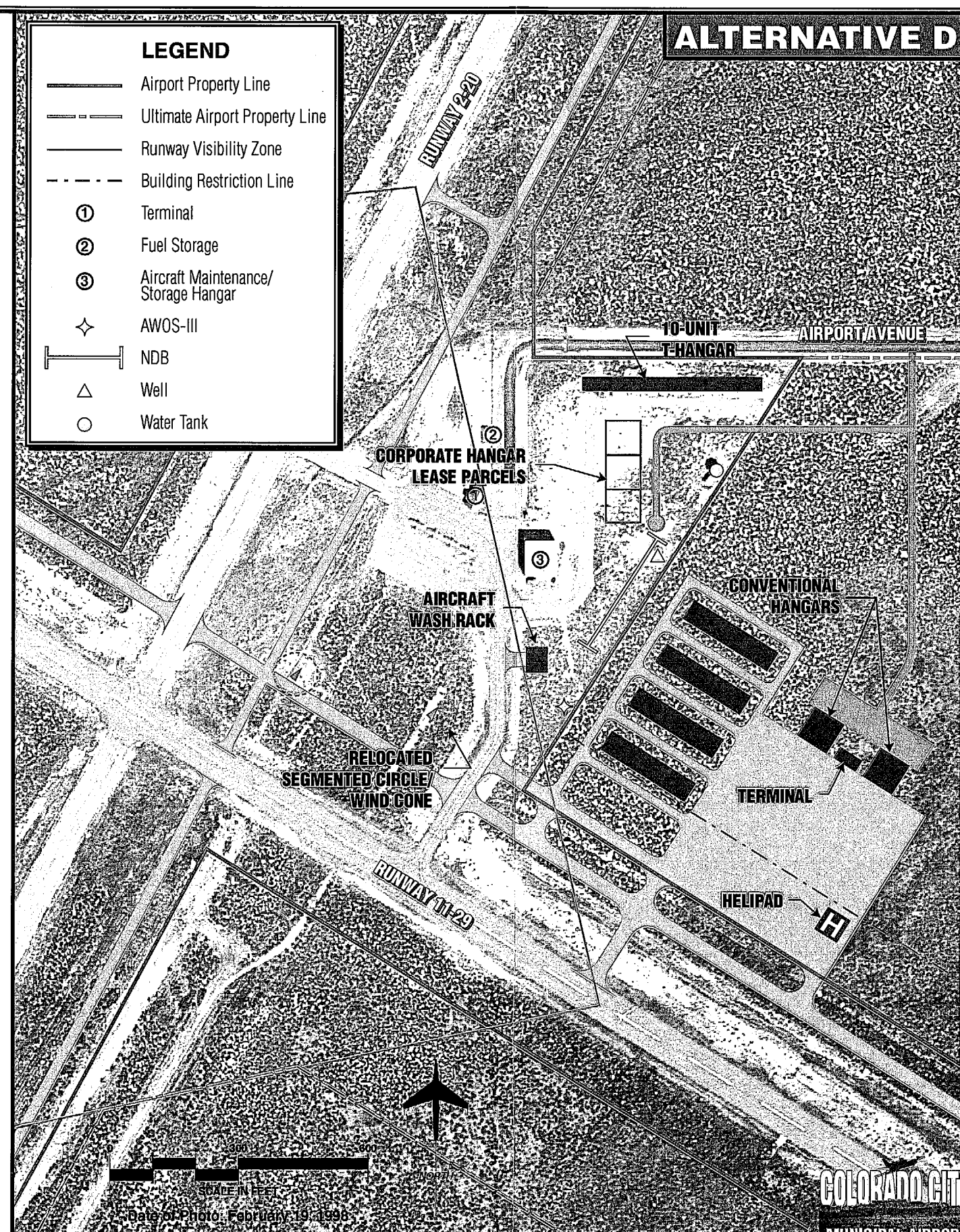
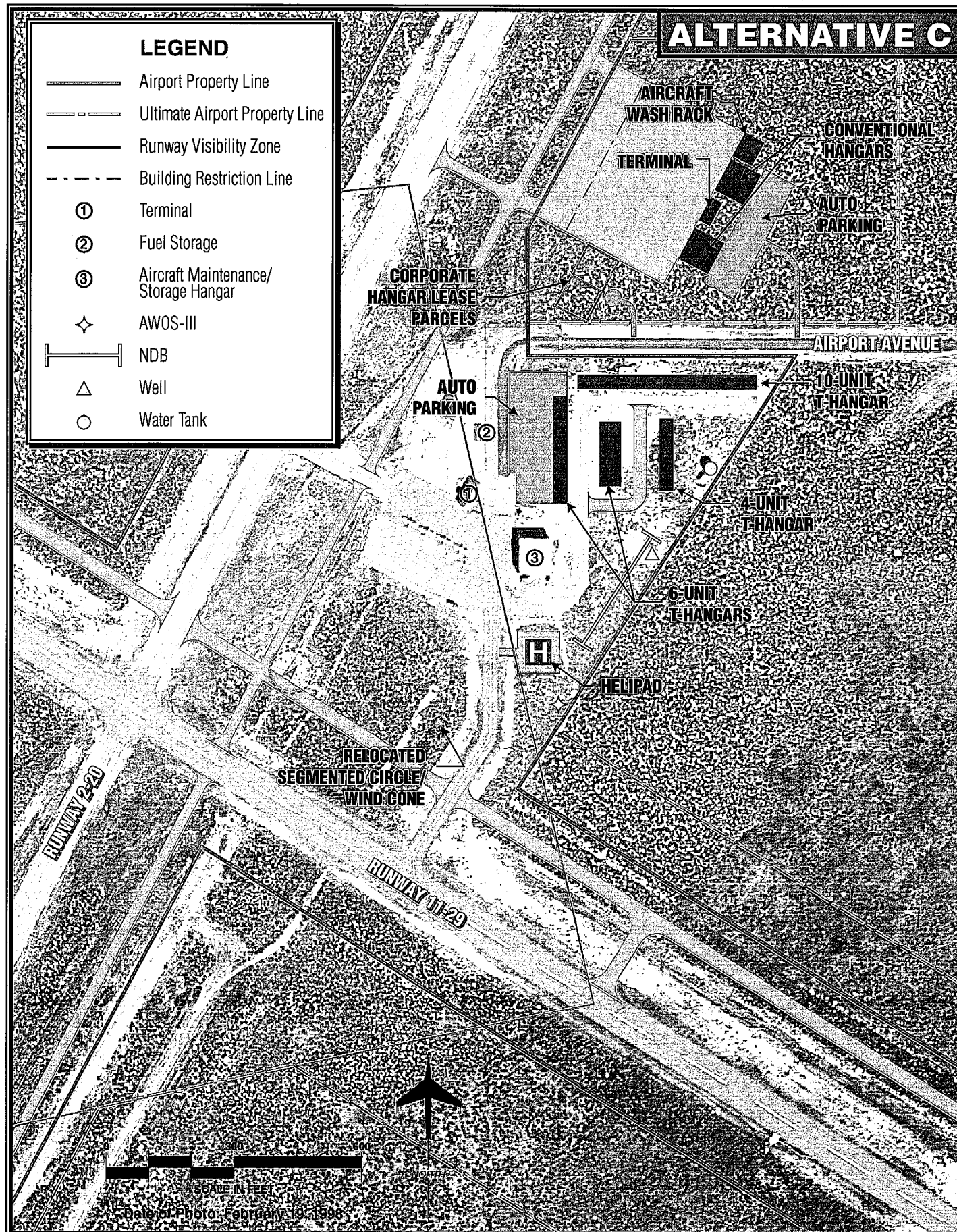
Advantages: This alternative provides for relocation of facilities outside the RVZ and provides sufficient area to accommodate long term growth.

Disadvantages: This alternative requires relocating the AWOS-III and NDB. Apron expansion to the south would be limited by minimum set-back distances from Runway 11-29.

Landside Alternative C, depicted on **Exhibit 4C**, proposes acquiring property to the north of Airport Avenue for the relocation of facilities within the RVZ and to accommodate projected long term growth. In this alternative, all tiedown, terminal, and conventional



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hangar functions would be relocated to this area. An aircraft wash rack would be developed along the north side of the apron. T-hangar development is directed along the existing T-hangar access taxiway. A helipad is proposed along the Runway 11-29 connecting taxiway.

Advantages: This alternative maximizes existing property and investments in pavement by developing T-hangar along the existing T-hangar taxiway. This alternative avoids displacement of the NDB and AWOS-III. The proposed apron area could easily be expanded to the north to accommodate long term growth. This alternative provides for the relocation of facilities which are currently inside the limits of the RVZ. All projected long term needs are met with this alternative.

Disadvantages: The T-hangars and helipad are separated from the primary terminal services which are designated for the apron area north of Airport Avenue. The primary apron and terminal area is proposed to be developed along the secondary runway (Runway 2-20). This runway is not designed for the requirements of the most demanding aircraft that may use the airport. Runway 11-29 is designed for this function. This alternative requires acquiring additional property to the north.

Landside Alternative D, depicted on **Exhibit 4C**, proposes acquiring property to the east along Runway 11-29 for the relocation of facilities within the RVZ and to accommodate projected long term growth. Development within

existing areas is limited to a single 10-unit T-hangar and three corporate hangar parcels along the T-hangar taxiway and an aircraft wash rack along the Runway 11-29 connecting taxiway. Long term T-hangar development is reserved for an area along the proposed apron. A helipad is marked along the southeast side of the proposed apron.

Advantages: This alternative avoids displacement of the NDB and AWOS-III. The proposed apron area could easily be expanded to the east to accommodate long term growth. This alternative provides for the relocation of facilities which are currently inside the limits of the RVZ. All projected long term needs are met with this alternative.

Disadvantages: This alternative requires acquiring additional property to the east.

SUMMARY

A preliminary master plan concept will be developed after the alternatives are reviewed by the Planning Advisory Committee and Town of Colorado City. Once the preliminary master plan concept has been identified, cost estimates will be prepared for the individual projects, a development schedule will be prepared, and potential funding sources for recommended projects will be identified (including those projects that are eligible for federal or state funding assistance). The remaining chapters of the master plan will be used to refine a final concept through the development of detailed layouts and a phased development

program. An environmental review of the proposed development by State and Federal agencies will also be conducted

to identify any potential environmental concerns related to future airport development.